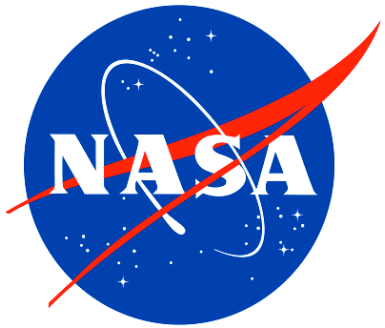
2009 OIB Antarctic data status

Multichannel Coherent Radar Depth Sounder – MCoRDS

CReSIS

Center for Remote Sensing of Ice Sheets

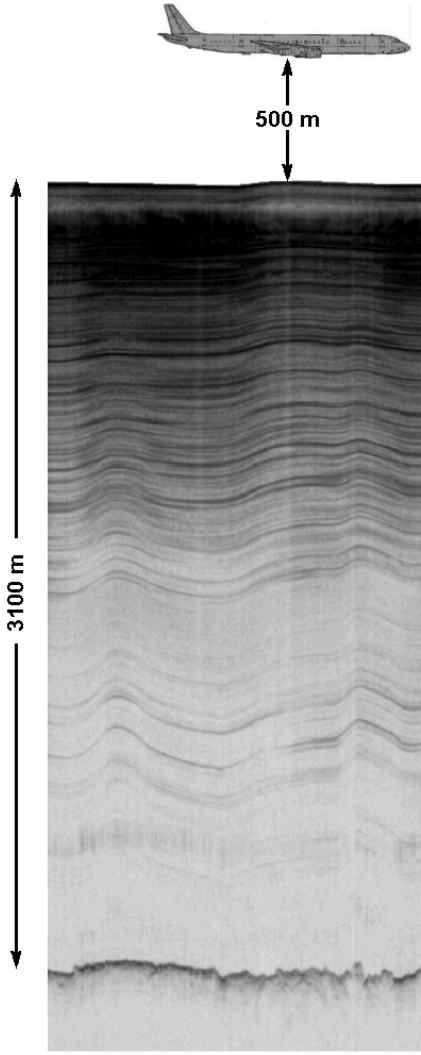


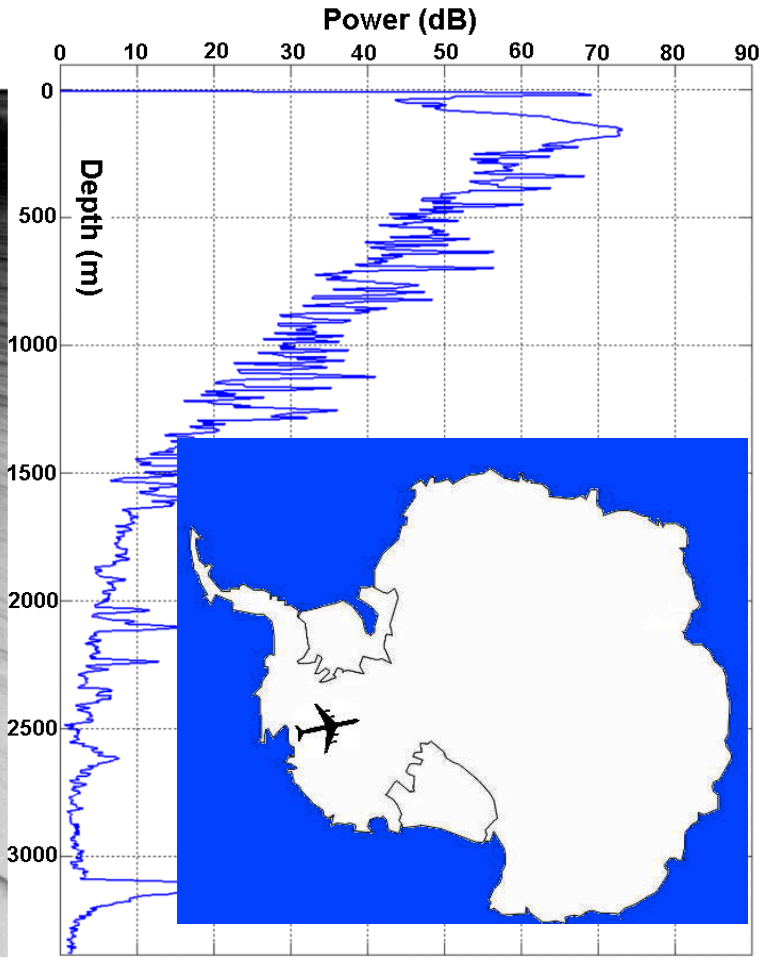
Radar depth sounding of polar ice

Multichannel Coherent Radar Depth Sounder (MCoRDS)

Platforms:	**DC-8**
Transmit power:	**500 W**
Center frequency:	**195 MHz**
Pulse duration:	**1, 10, or 30 μs**
Pulse bandwidth:	**10 or 30 MHz**
PRF:	**9 kHz**
Rx noise figure:	**5 dB**
Tx/Rx antenna array:	**5 elements**
Element type:	**λ/4 dipole**

Provides excellent sensitivity for mapping ice thickness and internal layers along the ground track.





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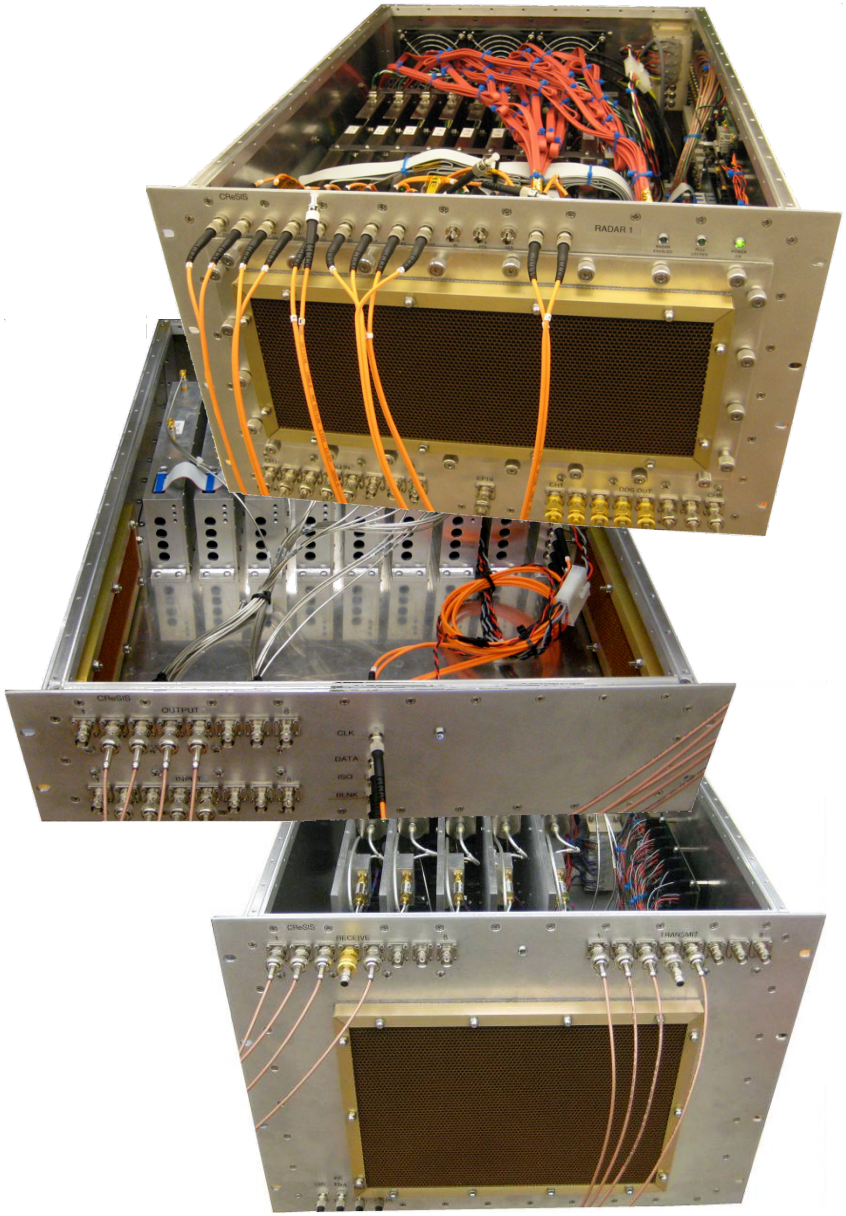
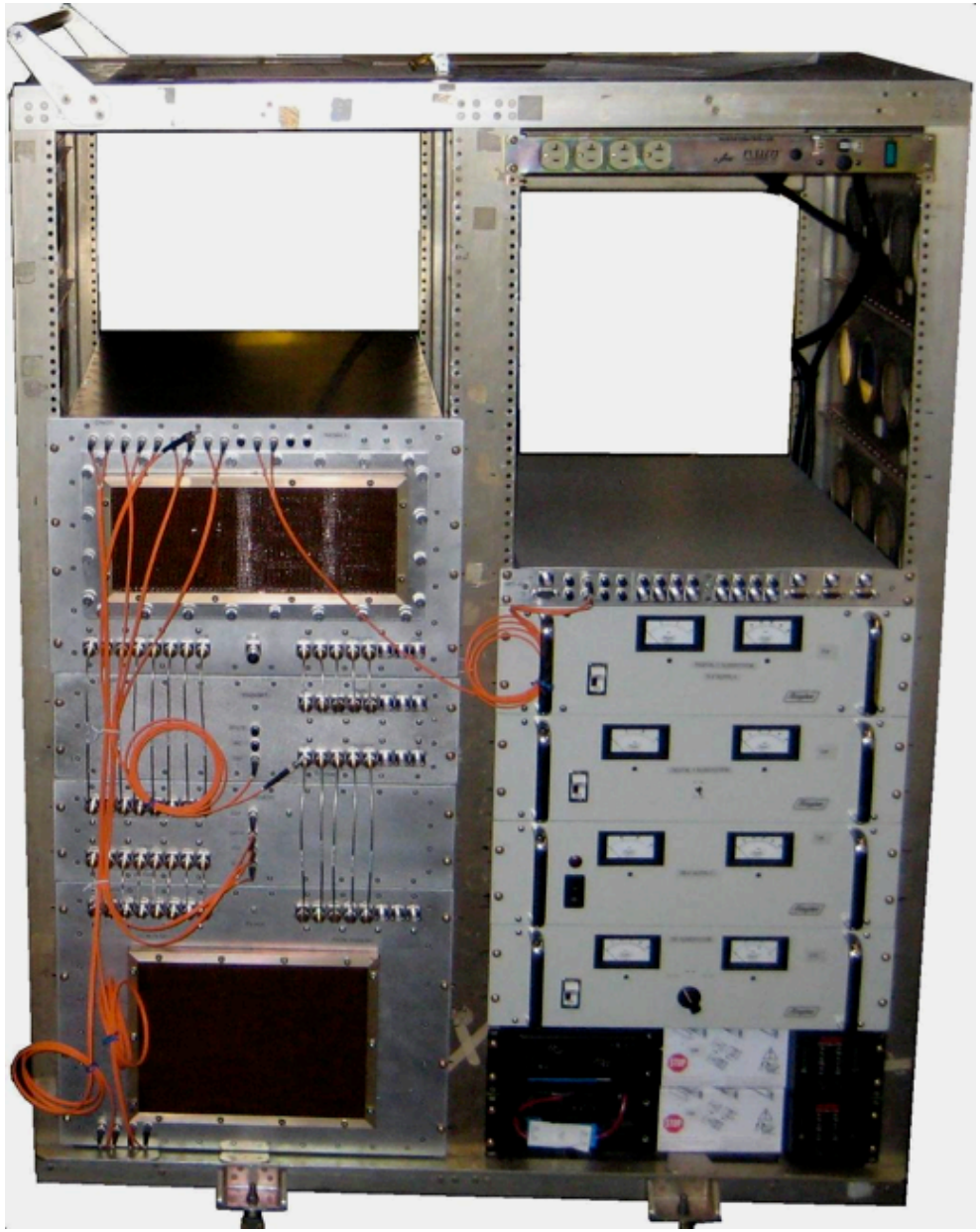
Sensor hardware for OIB DC-8

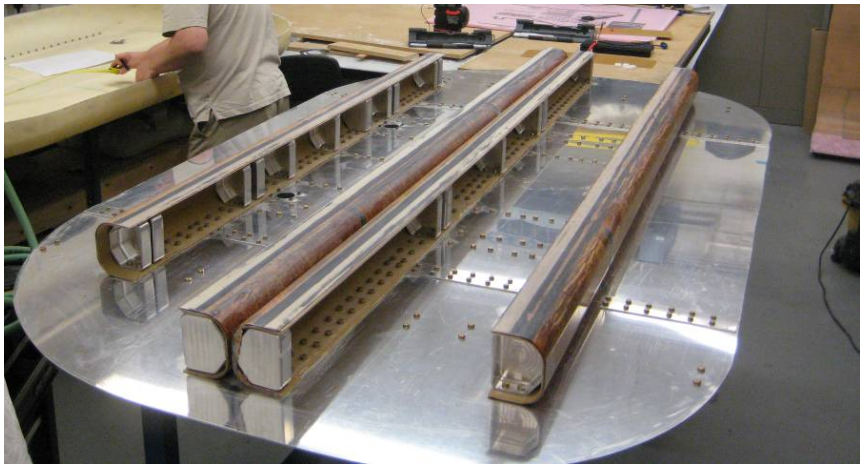
MCoRDS electronics

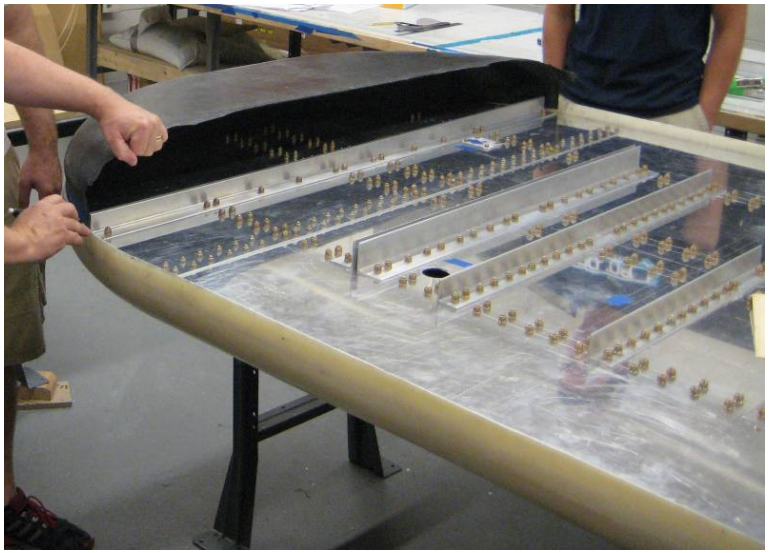




Sensor hardware for OIB DC-8

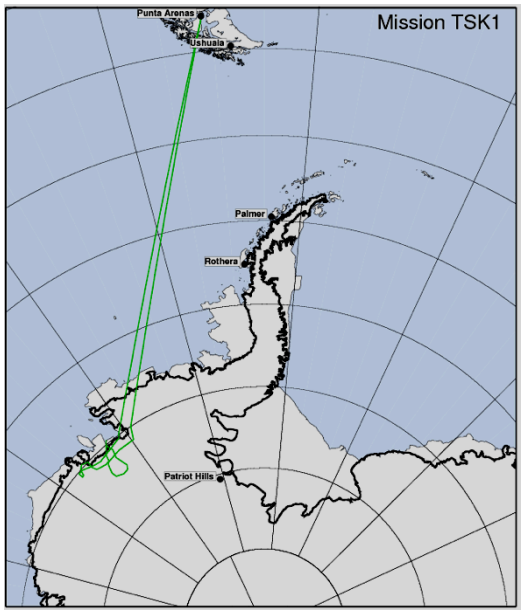
MCoRDS antenna and fairing hardware



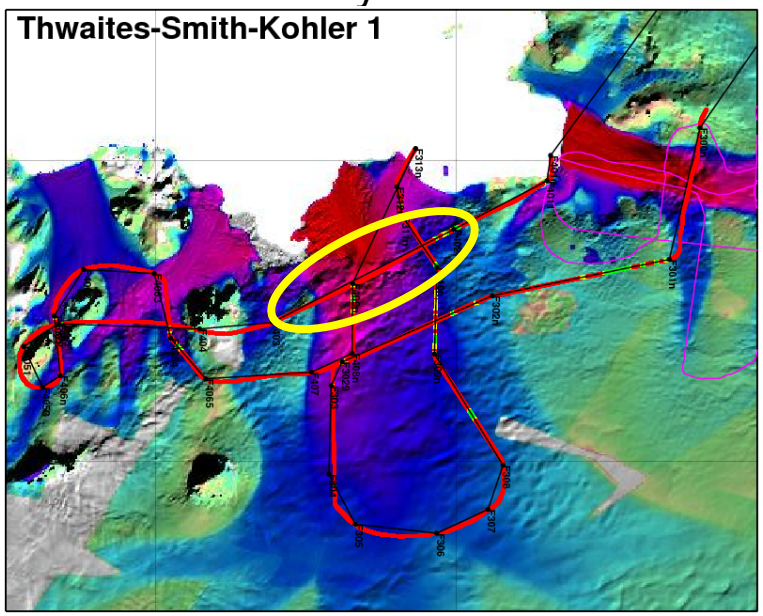


Example data from 02-Nov-09 Flight #12 TSK1 Mission

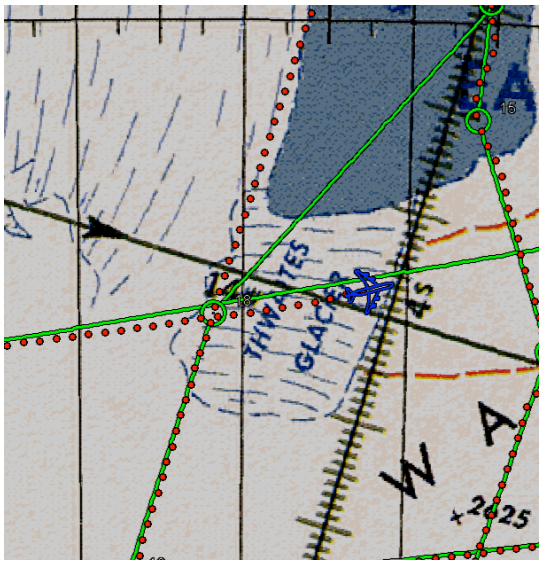
Mission Overview



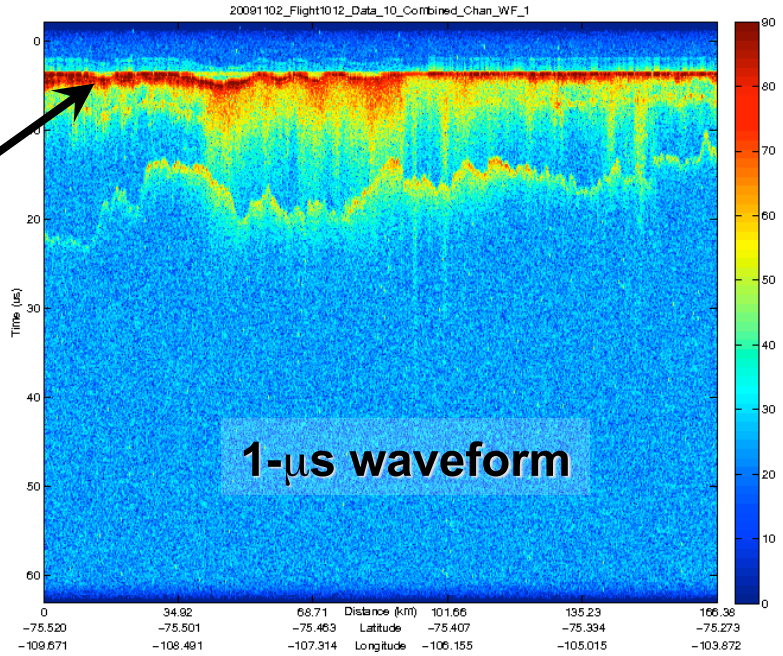
Survey Details

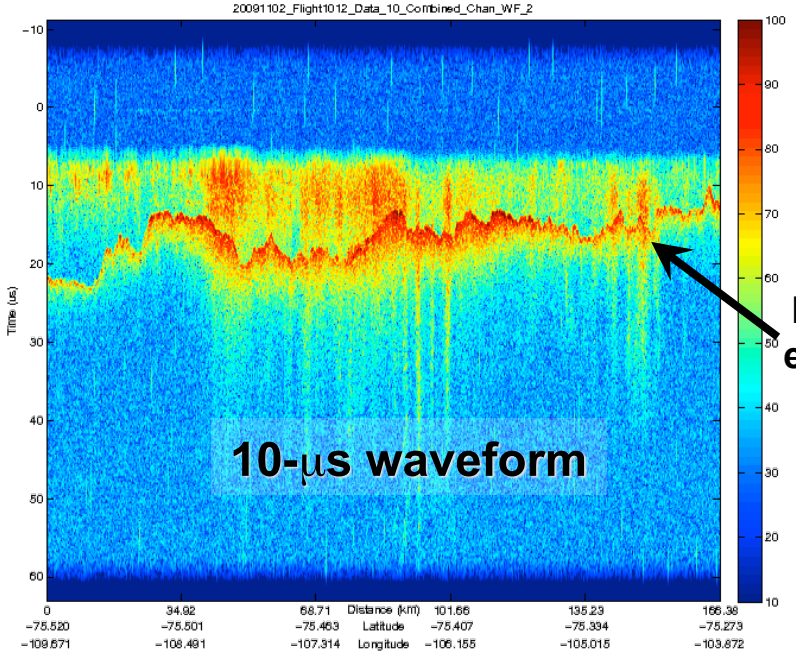


Falcon View Map



Surface echo





Bed echo

Challenges with data reduction

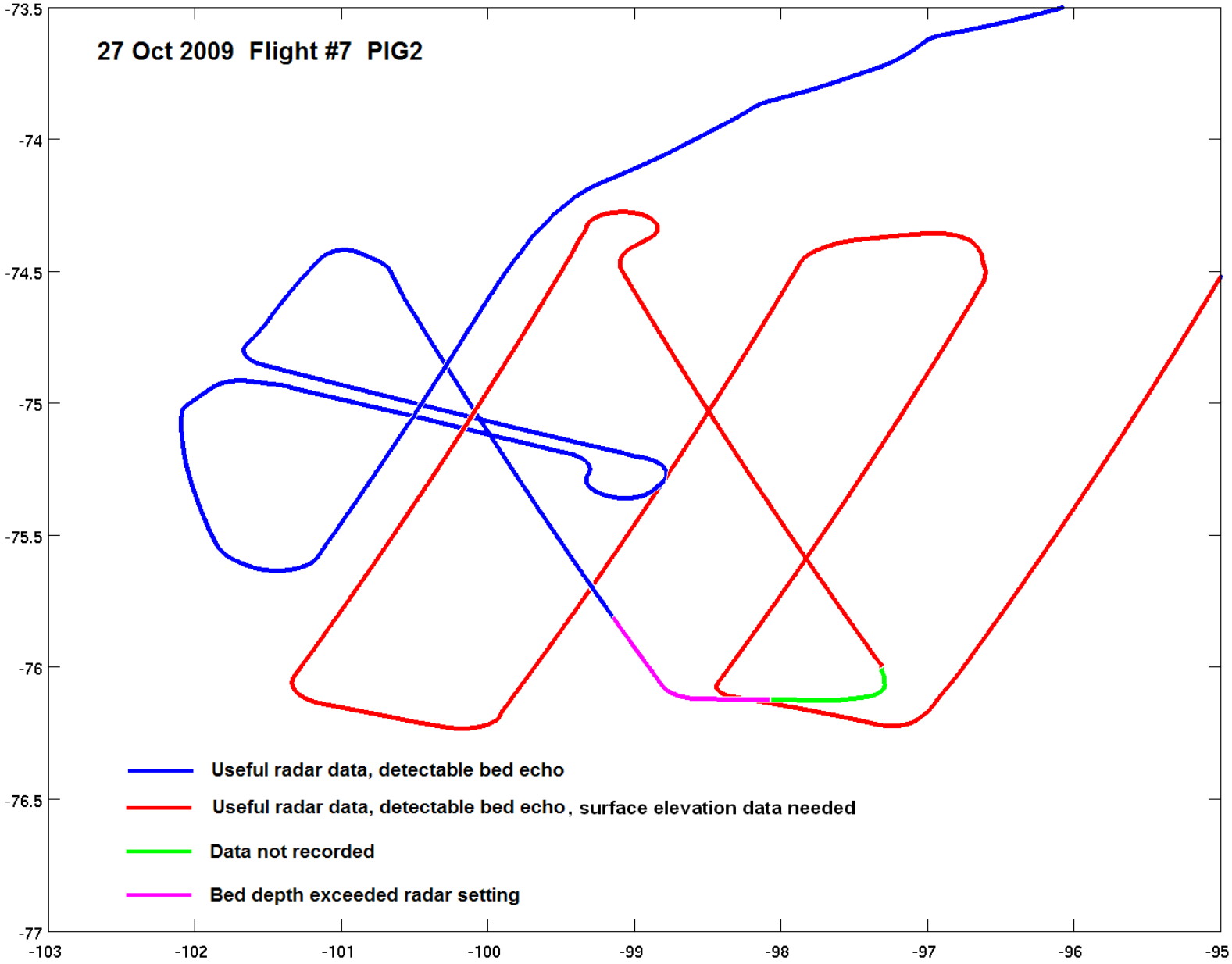
Data volume

- 22 TB from OIB exceeded CReSIS storage capacity
- CReSIS recently added 116 TB of storage capacity
- OIB MCoRDS data also being stored/processed at Indiana University (CReSIS partner)

Radar recording problem on Oct 27 & 28

- Radar settings caused system glitch and surface echo data were not recorded
- Must rely on surface elevation data produced by others

Challenges with data reduction



MCoRDS data summary and status

Flight #	Date	Survey Area	Data Set Volume (GB)	Priority	Planned completion
1	10/16/2009	GETZ	**1256**	**2**	**2/19/2010**
2	10/18/2009	TSK2	**1230**	**2**	**2/19/2010**
3	10/20/2009	Pine Island (High Alt)	**1016**	**2**	**2/19/2010**
4	10/21/2009	SeaIce2			
5	10/24/2009	SeaIce1			
6	10/25/2009	86° Arc (High Alt)	**1280**	**2**	**2/19/2010**
7	10/27/2009	PIG2	**1684**	**1**	**1/29/2010 [1]**
8	10/28/2009	TSK3	**616**	**2**	**1/29/2010**
9	10/29/2009	PIG1	**1416**	**1**	**1/29/2010**
10	10/30/2009	SeaIce3			
11	10/31/2009	PEN2	**1360***	**3**	**3/26/2010**
12	11/2/2009	TSK1	**1216**	**2**	**2/19/2010**
13	11/3/2009	PEN1	**1280**	**3**	**3/26/2010**
14	11/4/2009	PEN3	**2000**	**1**	**1/29/2010 [2]** **3/26/2010**
15	11/5/2009	Peninsula (High Alt)	**1624**	**3**	**3/26/2010**
16	11/7/2009	PIG3	**1392**	**1**	**1/29/2010**
17	11/9/2009	PIG4	**1184**	**1**	**1/29/2010**
18	11/12/2009	ABBOTT	**980**	**3**	**3/26/2010**
19	11/15/2009	PEN4	**1232**	**3**	**3/26/2010**
20	11/16/2009	PEN5	**1552**	**3**	**3/26/2010**
21	11/21/2009	TSK4	**912**	**2**	**2/19/2010**

PIG: Pine Island; TSK: Thwaites, Smith, Kohler

[1] Ice surface elevation data needed to complete processing

[2] Crane Glacier portion to be processed first, remainder of flight to be processed later

Deliverables (to be posted on CReSIS web site):

1. Ice thickness and bed elevation files
2. Ice thickness and bed elevation maps (3D for grids, 2D for single lines)

Science data products

Ice thickness data

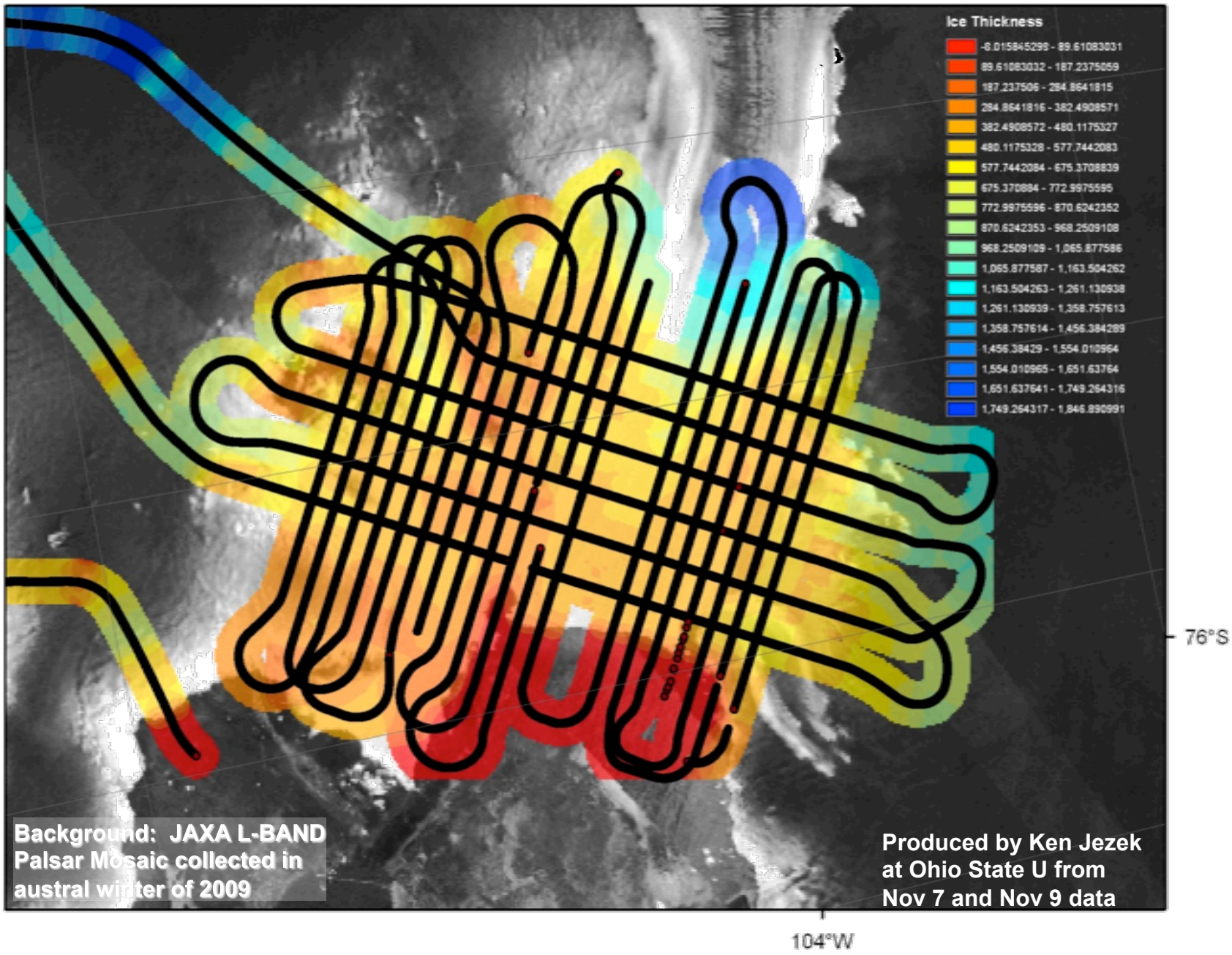
- indexed with GPS coordinates
- about 5-m thickness accuracy

Bed elevation data

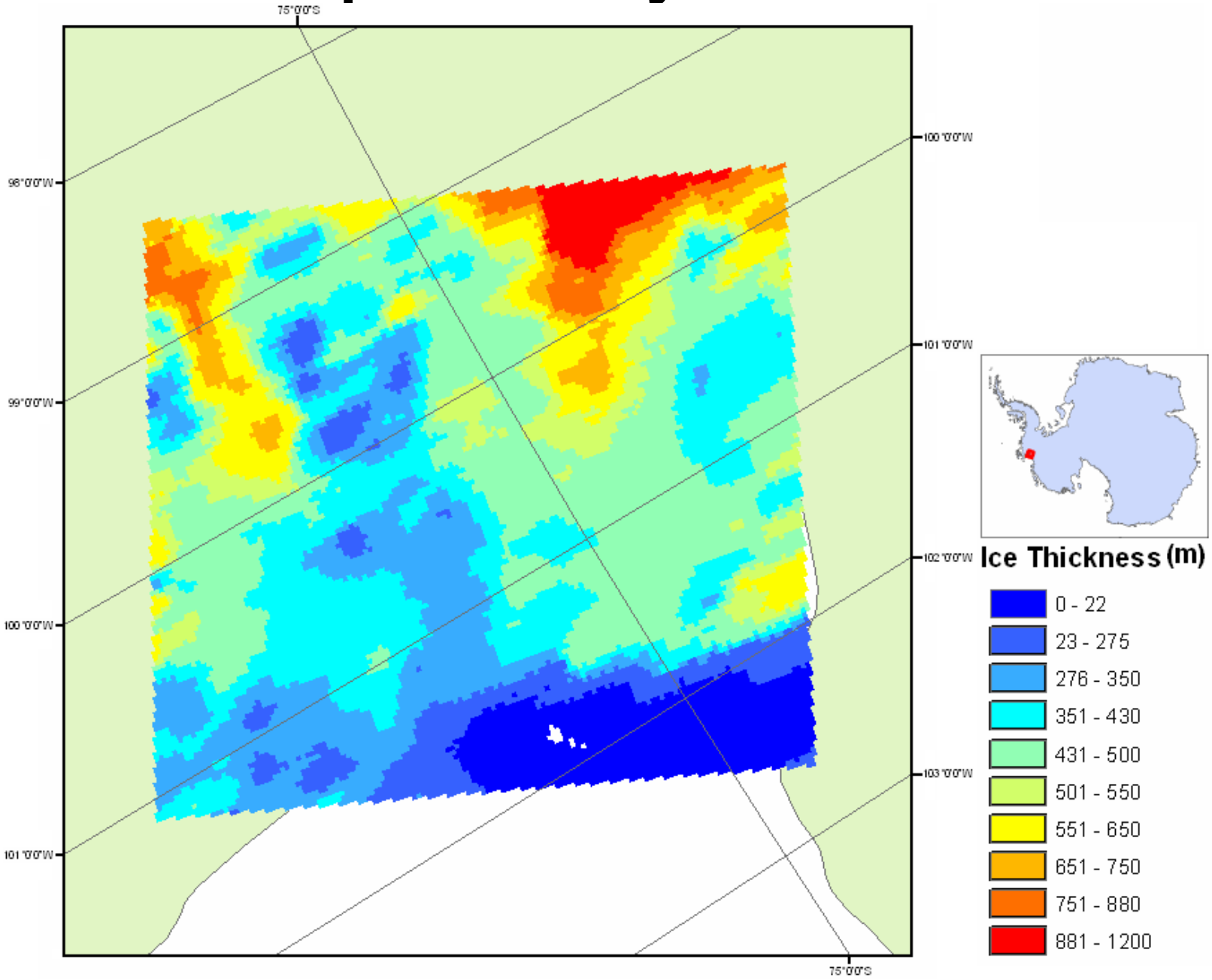
- indexed with GPS coordinates
- about 5-m elevation accuracy

Ice thickness and 3-D bed elevation maps

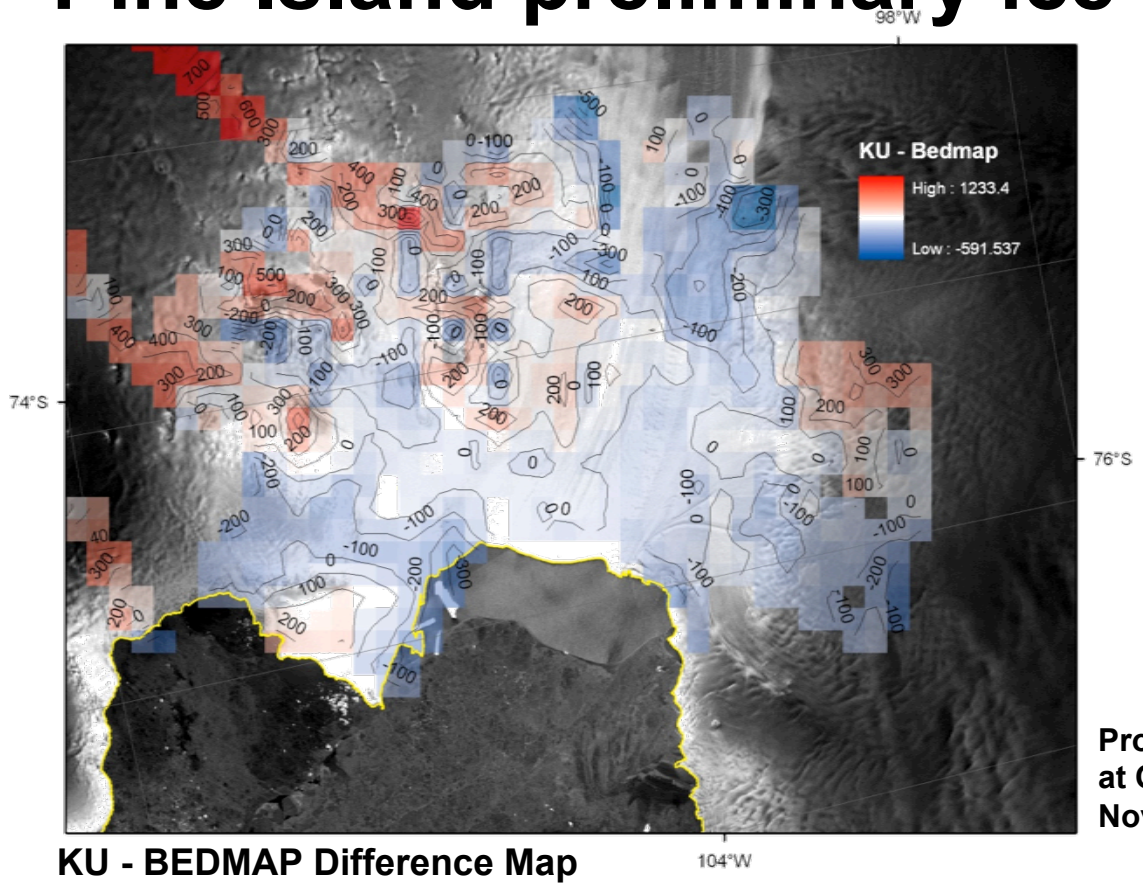
- spatial resolution dependent on surveyed grid density
- post accuracy about 5 m


Ice Thickness
-8.015845298 - 89.61083031
89.61083032 - 187.2375059
187.237506 - 284.8641815
284.8641816 - 382.4908571
382.4908572 - 480.1175327
480.1175328 - 577.7442083
577.7442084 - 675.3708839
675.370884 - 772.9975595
772.9975596 - 870.6242352
870.6242353 - 968.2509108
968.2509109 - 1,065.877586
1,065.877587 - 1,163.504262
1,163.504263 - 1,261.130938
1,261.130939 - 1,358.757613
1,358.757614 - 1,456.384289
1,456.38429 - 1,554.010964
1,554.010965 - 1,651.63764
1,651.637641 - 1,749.264316
1,749.264317 - 1,846.890991
Background: JAXA L-BAND Palsar Mosaic collected in austral winter of 2009
Produced by Ken Jezek at Ohio State U from Nov 7 and Nov 9 data
76°S
104°W

Pine Island preliminary ice thickness results



Pine Island preliminary ice thickness results

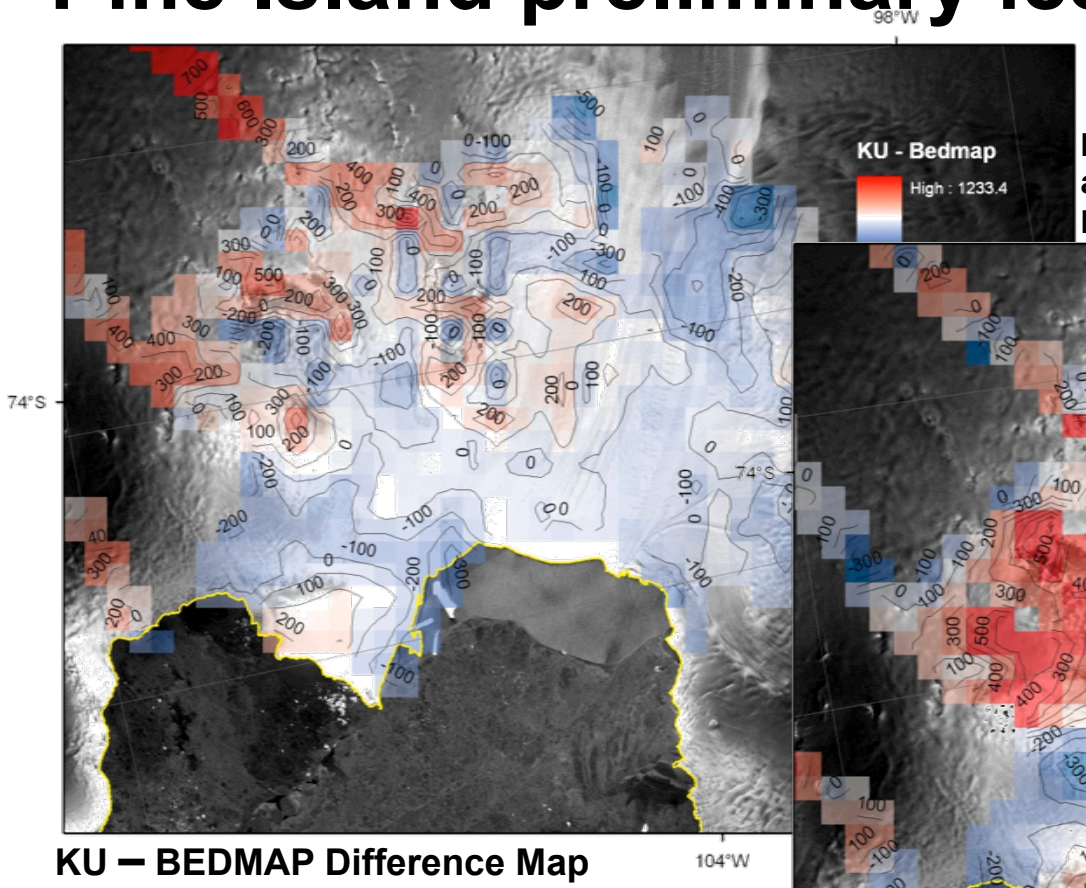


KU - BEDMAP Difference Map

Shows biases over the Hudson Mountains; favorable agreement over Pine Island Glacier; comparison indicates thinning in upper reaches of the data set.

Produced by Ken Jezek at Ohio State U from Nov 7 and Nov 9 data

Pine Island preliminary ice thickness results



KU – BEDMAP Difference Map

Produced by Ken Jezek
at Ohio State U from
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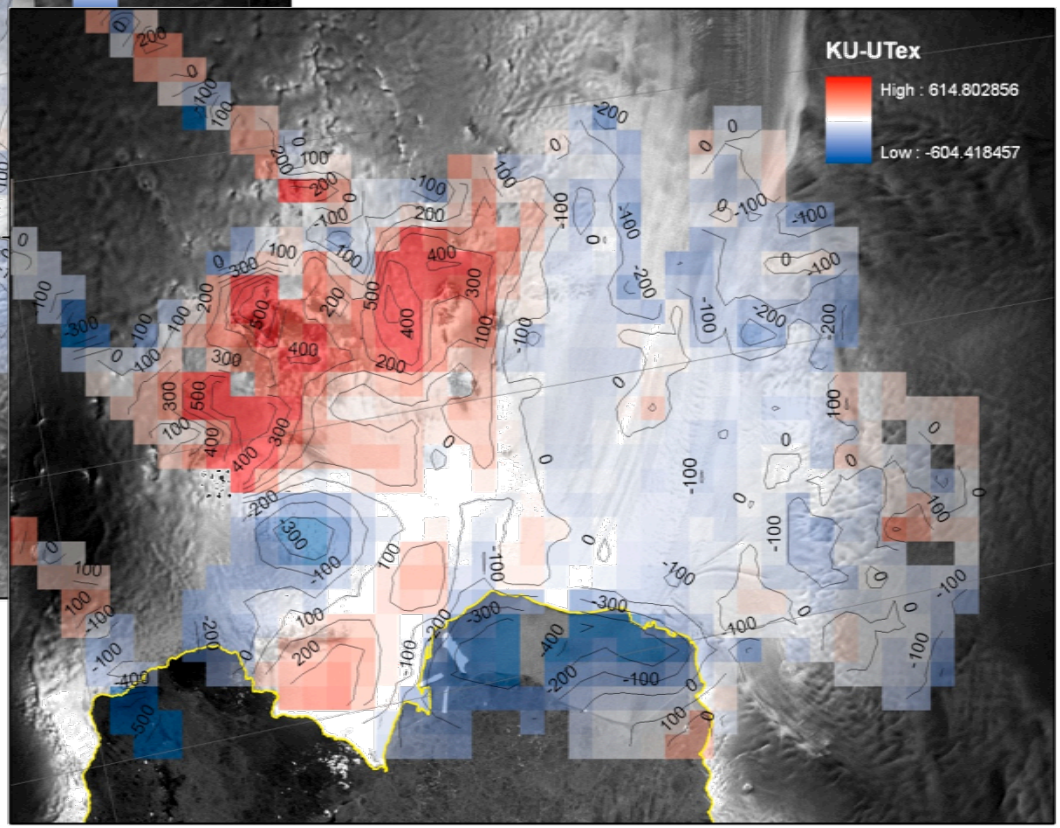
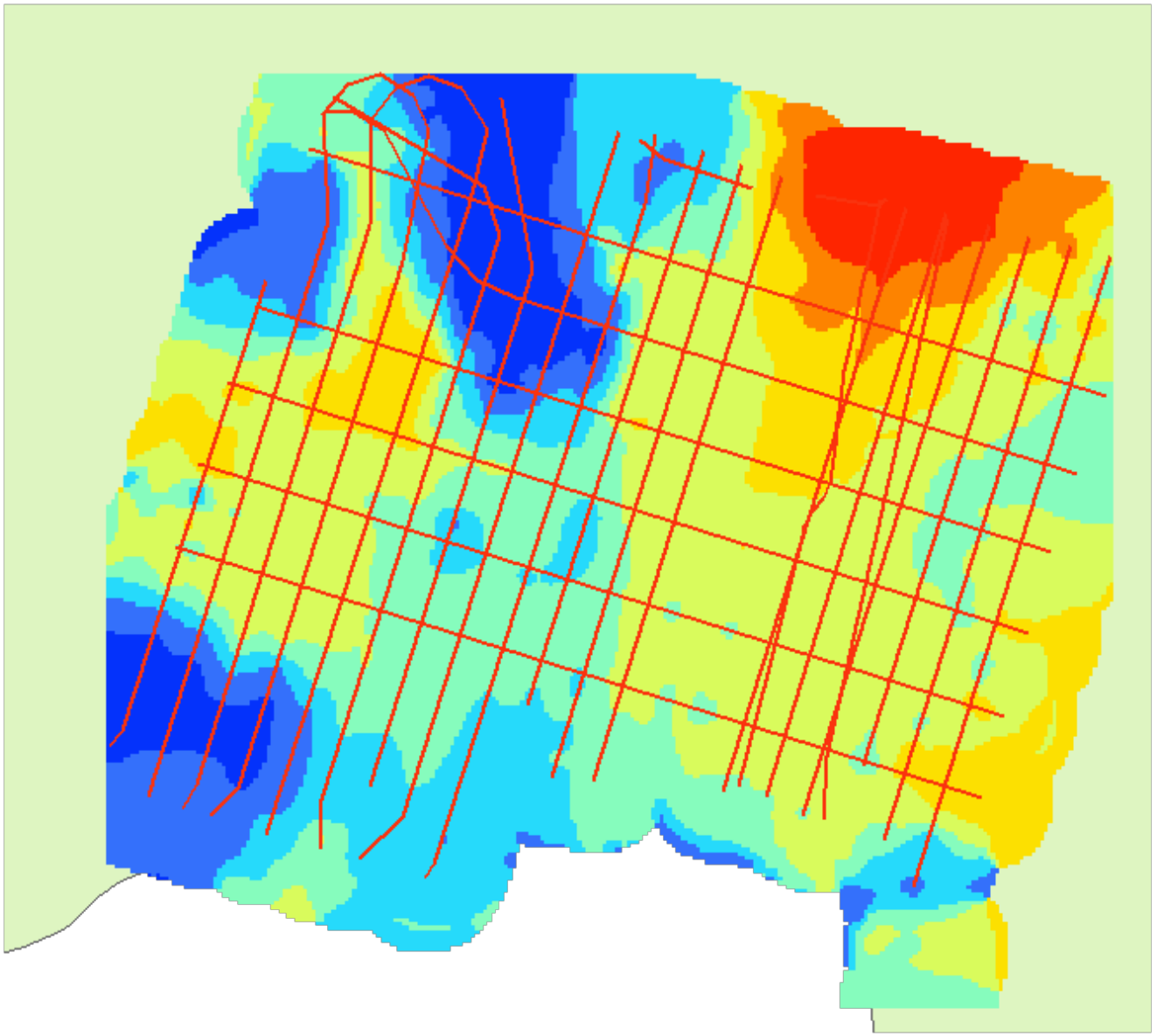
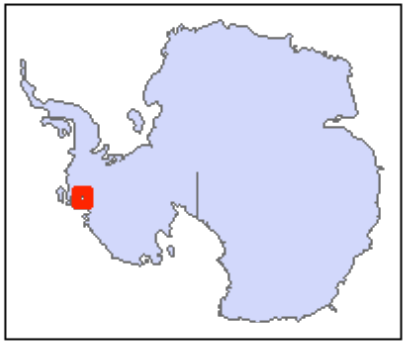


KU – UT Difference Map
Shows large differences over Hudson Mountains; excellent agreement on downstream portion of ice shelf. Some thinning suggested in upper reaches of data set. Texas gridded data report 200-300 m thickness in sea ice filled embayments.

Pine Island preliminary bed elevation results



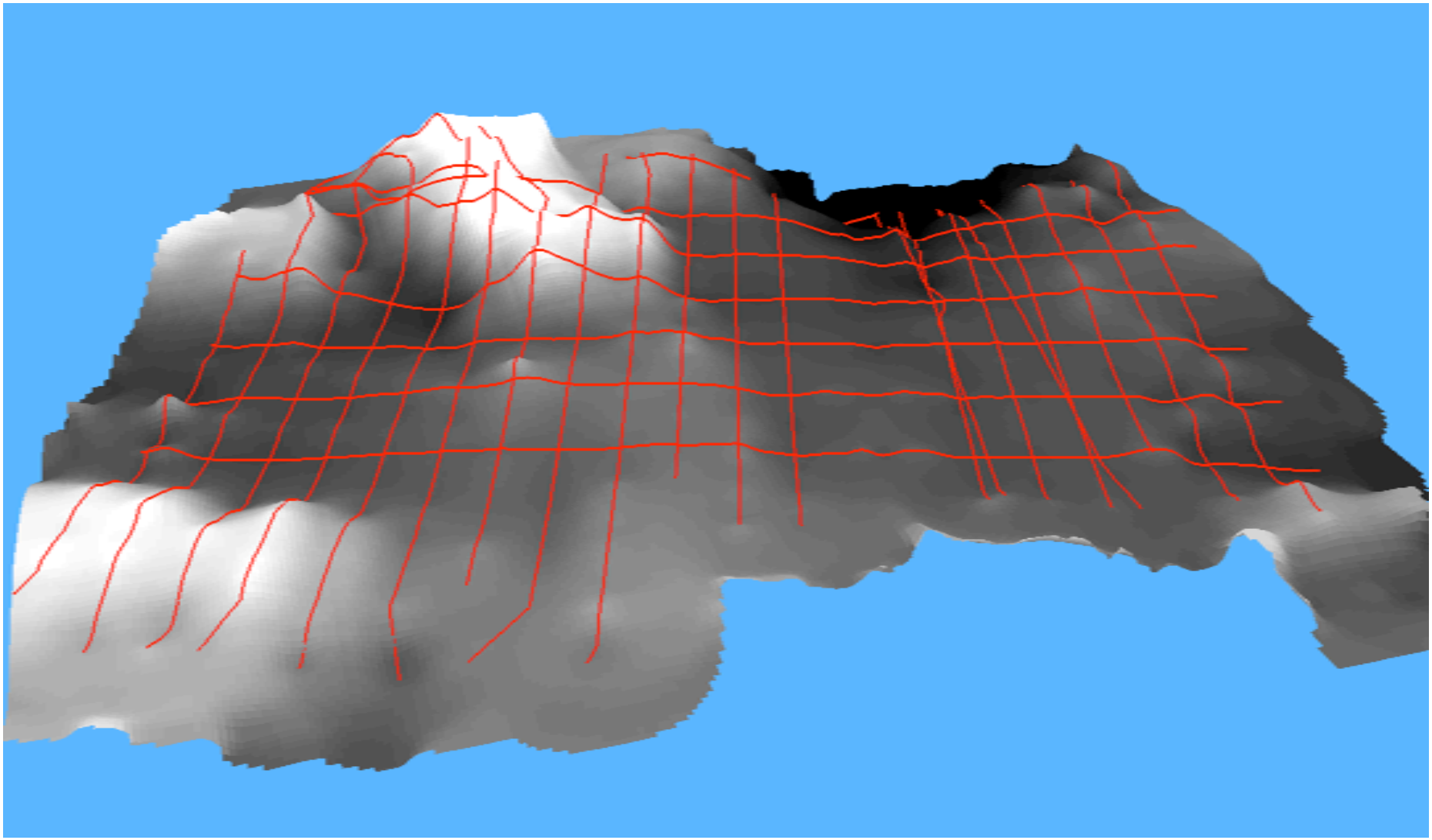
Relative bed elevation potential bias



Bed Elevation (m)

- -1,248 - -940
- -941 - -695
- -696 - -540
- -541 - -450
- -451 - -360
- -361 - -230
- -231 - -69
- -70 - 440

Pine Island preliminary bed elevation results



Conclusions

MCoRDS data processing is on schedule

Preliminary results from Pine Island geocoded thickness data seem consistent with ice margin location per the ALOS mosaic

Texas and KU gridded thickness data show evidence for thinning (100 m) on the ice shelf from 2004-2009

All data sets report substantial ice where there are in fact rocky outcrops.

U.Texas gridded data show thick glacier ice in what must be sea ice embayments.

Icebridge and 2004 data segment are systematically different by about 50 m (thinning or a timing bias?)